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Atoms and Knowledge

for *Atomism in Philosophy: A History from Antiquity to the Present*, ed. Ugo Zilioli, Bloomsbury Academic

This is a paper about knowledge of atoms. It is not, however, about knowledge concerning *atomic things*, whether those be atoms of chemistry, physics, or metaphysics. It is instead about knowledge of what is true of things, atomic or otherwise, and about whether this is or amounts to knowledge of *atomic truths*. My aim will not be to answer this question, but to trace out the appeal of this picture and unearth and explore a central ambiguity in our thinking about it.

The atoms that concern me are atoms of truth not of being. I am not a historian of philosophy, but the roots of the idea probably reach into the early soil of our discipline. Just as it is very natural to think that the objects of ordinary life are made of smaller things, which are made of smaller things, which are made of smaller things, and so on, it seems natural to think that the truths of everyday life have a mereological structure of some sort. Suppose it is true, for instance, that most cars on the road today are diesel. That truth (that most cars on the road today are diesel) seems to be made up, in some uncertain way, of various other truths – that there are cars on the road, that being diesel is a way for a car to be, that diesel is a kind of fuel, and so on.

This may seem an outlandish thing to say. These days we are more accustomed to speak of truths entailing other truths than of truths containing or having other truths as their more basic material (except in cases where words like ‘and’ and ‘but’ do the knitting that a quick pull would unravel). I grant this, but think talk of entailment rather than of containment or inclusion is a theoretical move rather than an expression of a natural view or starting place. Suppose it is true that most cars on the road today are diesel. Part of what’s true when that is true, surely, is that diesel is a kind of fuel, that there are cars on the road today, the being diesel is a way that cars can be, and so on. Or to put it another way, for it to be true that most cars on the road today are diesel, all these other truths have to be true – it has to be true that there are cars, that diesel is a fuel, that being diesel is a way for a car to be, that there is some period of time that is today, that there’s such a thing as time such that there can be periods of it, and so on.

Moreover, the truth that most cars on the road are diesel does not seem to merely entail these other

truths, as it does the truth that $2 + 2 = 4$. It is rather that it seems to involve them in some constitutive way. Take all these other truths and fuse them into a mass – *that* is the truth that most cars on the road today are diesel. This claim is intolerably picturesque, to be sure, but the starting place in philosophy always is.

The ‘and so on’ in the above paragraph echoes the ‘and so on’ when we say that physical things are made of smaller things, which are made of smaller things, and so on. In both cases there is the suggestion that the direction of travel continues to a place we cannot see or cannot say. In both cases we move from what we can see (that a house is made of bricks, and bricks of clay and straw, and clay and straw of finer things in turn) or what we can say (that most cars on the road are made of diesel, that diesel is a fuel, that being diesel is a way a car can be) to things we cannot see or say but conjecture must be there.¹

I have tried to motivate the idea that it is natural to think that truth has a mereological structure by appeal to the idea that when something is true, or at least when the truths of ordinary life are true, they seem to consist in other, smaller truths being true, where smaller here is not a spatial notion but a containment notion. But there are other ways to motivate the idea if these remarks do not get purchase with the reader. Think of what is true – all of it. Does it not seem, *prima facie* at least, that what is true (the totality) is built out of, or made up of, other truths or collections of truths? (The ‘build up’ relation may be no more than conjunction or concatenation, but that is all we’d need.) Or to put it another way: There is what’s true, right? (Here the reader is asked to assent.) Now, is that just what’s true, end of story, or is what’s true made up, in some way, of all the things that are true? I think it is hard to imagine how it could be otherwise.

The focus in the paragraph immediately above is on all the truth, or on what’s true without any domain restriction, but a parallel line of thought can be generated for any more narrow subject matter. Think of what’s true concerning continental drift, that is, what’s true concerning the process whereby continents move, migrate, break apart and conjoin. Let’s call that the truth about continental drift. Does that truth not seem to consist in other truths? Again, I find it hard to understand how it could not. Or

¹ Compare Russell in *The Philosophy of Logical Atomism*. “When I speak of ‘simples’, I ought to explain that I am speaking of something not experienced as such, but known only inferentially as the limit of analysis. It is quite possible that, by greater logical skill, the need for assuming them could be avoided.” (143)

consider what's true concerning whether I am writing this paper on a laptop. If it's true that the truth about continental drift consists in or contains other truths, it's not easy to see how the truth about whether I'm writing this paper on a laptop doesn't. The truth is that I am writing it on a laptop. And part of that is the truth about what a laptop is, what writing is, what it is to write on a laptop, and so on.

If there is resistance to these remarks, one source of it could be that there is an important difference between how we think of parthood or containment for physical things compared to for truths. If x is a physical object and y is a proper part of x , then y is smaller than x in a relatively straightforward sense. Moreover, if x is not identical to z , but both x and z have y as a proper part, then x and z must overlap, again in a relatively straightforward sense. Neither of these things seem the case when we think of truths containing other truths. Most cars on the road are diesel, we suppose. Part of what's true when that is true is that diesel is a fuel – that diesel is a fuel is part of the truth that most cars on the road are diesel. But there is no straightforward or obvious sense in which the truth that diesel is a fuel is smaller than the truth that most cars on the road are diesel.² Moreover, the first rocket that flew to the moon (let us suppose) ran on diesel. That diesel is a fuel would be part of that truth, too. But the truth that most cars today are diesel and the truth that the first rocket that flew to the moon ran on diesel don't overlap in any straightforward or obvious way, despite them having a part in common.³ In light of these differences, we might find it quite strange to think that truths contain other truths or have other truths as parts. I think this response is perceptive, but misdescribes what it notices. It *is* strange to think that truths contain other truths as parts. This could be a sign that truths don't have other truths as parts. But concluding that is rash and two possibilities strike me as more likely. First, we could construe the puzzle as generated by one's having attached to the general notion of containment or parthood aspects that are particular to spatial containment or parthood. Physical parts are smaller than what they are parts of, and overlap makes sense with physical things, not because of parthood itself but because of the nature of physical objects as

² More is true when it's true that most cars are on the road are diesel than when it's true that diesel is a fuel, since when it's true that most cars on the road are diesel it's true that diesel is a fuel and more besides. So there is some sense in which the one truth is smaller, or less truth, than the other. My point is not that this isn't the case, but that it is not straightforward how to understand it.

³ Again, the idea is not that they fail to overlap, but that if they do, it is not in a readily-understood way. We could say they overlap by having a part in common. But that is empty in the absence of a way of understanding them as having a part that is in the same place; that is what we are missing. We could talk of propositional space and say that the truth they share as a part occupies such and such position in propositional space, and that that is how or why they overlap. But that redescribes the problem rather than solves it.

extended. Alternatively, we could think the lesson is that work needs to be done to make clear what ‘smaller’ and ‘overlap’ mean in the realm of truth; the lesson on this interpretation is only that there is a gap in theory, not that talk of parthood with regard to truth is unintelligible.⁴

What I have tried to offer so far is some reason to think it is natural to suppose that truths, at least the ones of everyday life, are made of or contain other truths, however unclear the exact nature of this is. This alone does not get us to atomism about truth. It could be, for instance, that all truths are made of other truths, that the structure of truth is one of infinite descent. As in the case of atomism in the domain of physical things, however, where it is natural to move from observing a direction of travel to imagining there must be an unseen place it ends, in the domain of what is true it is perhaps natural to think that if ordinary truths are made of or contain other truths, this all has to stop somewhere. I am not saying this is correct or, certainly, that to the degree the atomic picture is a natural one that this aspect of it is normally in view. The suggestion is rather that, if pushed on where the travel goes, it is perhaps natural to think it must stop somewhere.⁵

Wittgenstein and Russell describe the most austere version of this picture, each with his own distinctive eloquence:

Wittgenstein: If all true elementary propositions are given, the result is a complete description of the world. (*Tractatus*, 4.26)

Russell: If the world is composed of simples—i.e., of things, qualities and relations that are devoid of structure—then not only all our knowledge but all that of Omniscience could be expressed by means of words denoting these simples. We could distinguish in the world a stuff (to use William James’s word) and a structure. The stuff would consist of all the simples denoted by names, while the structure would depend on relations and qualities for which our minimum vocabulary would have words.

⁴ See Yablo 2015 for a discussion of the generality of parthood. As he puts it there, “To learn that *x* is or has a part, however, tells you nothing about the sort of thing it might be, considered in itself. Philosophers have discovered some strange entities over the years, but nothing so ontologically outre as not to stand in mereological relations.” Yablo’s discussion there clearly suggests that truths have other truths as parts. See also Yablo 2014 and Lewis 1988.

⁵ Russell seemed to have thought, at least at times, that this was a straightforward matter, as he remarks in his lectures on logical atomism “I confess it seems obvious to me (as it did Leibniz) that what is complex must be composed of simples, though the number of constituents may be infinite.” (337) An alternative picture is offered by Eugene Bronstein, writing in the newly founded journal *Analysis* in 1934. He insists: “[I]t is nothing but a risky inference from a directional analysis to basic facts; and that as *termini ad quos* of the analysis basic facts may or may not in fact exist...I wish very humbly to suggest that...though we can have several things that are simpler, we can never have anything that is simple.” (1934: 11-14)

For both of them, as expressed here in these passages, it is not just what is true is made up of other truths, nor that there is, way down at the bottom, an atomic level where all the truths bottom out. It is that this set of atomic truths is all the truth there is, at least in the sense that they describe reality completely and one who knew them would be omniscient. I describe this as austere because it holds that just as one might think that non-atomic physical objects are *no addition to being*, non-atomic truths are *no addition to truth*.

I hope the above remarks capture one way in which it is natural or common to have a picture of truth or of what is true on which it is ultimately atomistic. Much of it will sound at least broadly familiar. My own view is that this picture is ultimately unintelligible, although I will argue for something more modest here. To get to this, however, it will help to briefly address two different ways we might think of atomism in the realm of being rather than truth.

Consider what Travis Dumsday (this volume, pg X) calls atomism version 1 and atomism version 2. Version 1 takes nature to bottom out at indivisible nonextended point particles; things are made of smaller and smaller things, and so on, until you reach things that have no size and are not divisible. Version 2 also takes nature to bottom out, but at indivisible extended objects; things are made of smaller and smaller things, and so on, until you reach things that have a size but aren't, for whatever reason, divisible. Both versions face thorny problems. Version 1 struggles to explain how things that have no size can, together, have a size, as they seem to when they compose any ordinary physical object. Version 2 struggles to explain how something can be extended but not be divisible, even in principle, given that it seems that to be extended is to be such that a bit of you is here and a bit of you is there. The relevant thing to notice for present purposes is this: if atoms are as version 1 construes them, then they have number but not extent or volume; how much of them you have can be answered with a number but not with a volume. Version 2, in contrast, is different: on that picture, there are some number of atoms, and each has a size because each is extended (perhaps they're all the same size, perhaps they differ in size). The answer to how much of them you have could, depending on context or speaker intention, properly be given by a number or properly be given by their collective volume.

I have briefly looked at this distinction in kinds of atomism about things because a similar distinction can be drawn about atomism in the domain of truth. One sort of atomism about truth would

be a version 1 version, wherein what is true is given by some number of truths and how much is true, or how much truth this person knows or that book expresses, etc., is only (ever) answered with a number – the only dimension truth has is cardinality. A quite different version would be a version 2 picture wherein there is some proper quantitative dimension in the domain of truth beyond this, something akin to the notion of volume in the domain of atomic objects. On this version of atomism about truth, there would be some number of truths and each truth would have a size, although of course this is analogous to rather than the very same thing as size with regard to physical objects. Set aside for the moment, please, the question of why one would ever endorse this sort of atomism – we will get to that. The point is only to see that there could be such a version of atomism in the domain of truth. The modality in that sentence is meant, at this point, to be only epistemic: for all we know, not yet having thought about it, there could be a size or size-esque dimension to truth beyond cardinality.

In my view, this is not something that we have thought enough about, and there are concomitant, deeply interesting questions (to me anyway!) that lie in the same region.⁶ Part of the explanation of this is that we tend not to think about atomism about truth in a serious way; hence it is not surprising that we tend not to think about whether an atomism in which the quantity of truth dissolves into number is or is not to be preferred to one where at the bottom level there is number plus extent-of-truth. That said, though, we do think, at least obliquely, about the number vs number plus extent question when we talk about truth not at the bottom level, so to speak. I will try to give a sense of what I mean.

First, there are times that we seem to think of truths (ordinary, everyday truths, not atomic truths) as having both number and extent. Consider how common it is to talk, loosely and metaphorically, of adding some truths to one's stockpile. I don't think those who employ this metaphor have likely thought much about, much less mean to commit, to what is embedded in that metaphor: that truths have both number and an extent just as the durable goods and materials that are found in literal stockpiles have both number and volume. If 'stockpile of truths' were the only such example, it would best be thought of as an idiom rather than suggestive of an ambiguity in thought concerning whether truths (of the ordinary rather than the atomic kind) have only number or number plus truth-extent. But similar examples

⁶ For instance: How much is true? Does how much is true vary from time to time or world to world, or is it necessarily fixed and unchanging? Is there more true of that city than there is of this apple, or is just as much true of one as of the other? I can change what is true, but can I change how much is true?

abound. Philosophers talk of piling up truths or of truths being heaped up, and there is a pervasive use of mass and spatial terms to talk of truth and of content (that which is true or false).⁷ Sometimes, this is taken as far as the claim that truth has extent only rather than number, a kind of stuff ontology of truth. For instance, in discussing the principle of charity, Davidson notes it is usually characterised as the idea that we should interpret a person such that most of what she believes is true, and then says:

This way of stating the position can at best be taken as a hint, since there is no useful way to count beliefs, and so no clear meaning to the idea that most of a person's beliefs are true. A somewhat better way to put the point is to say there is a presumption in favor of the truth of a belief that coheres with a significant mass of belief. (Davidson 2001, p. 138-139)

Here Davidson is talking about belief, but it is clear the point is as much about truth or true content.

There's no clear meaning to the idea that most of a person's beliefs are true because what a person believes (true and false propositions) can't be counted, he thinks. Doubts about the intelligibility of the idea of counting shift him toward a picture on which the plural count vocabulary (most beliefs, most truths) is replaced with massy vocabulary (a significant mass of belief/truth). We need not endorse that more radical conclusion to recognise that in ordinary thought and talk, we sometimes seem to think of truth as both having number and as having extent, albeit in some unresolved, unclear fashion. We speak of the truth, of truths, of many truths, of more truth, of much truth, and so on.

I take pains to emphasise that the above talk of truth is suggestive but no more. I think if we look carefully we see that the opposite conception is *also* latent, that it is also latent that what is true has number but no other dimension of size. One way to see this is to note that many philosophers seem to think the question "how much truth does a person believe" and "how many truths does a person believe?" are synonymous. Consider for example the following remark by Foley and Fumerton (1982):

It is no doubt true that most people would be inclined to agree with Lehrer's and Rescher's suggestion that we should try to believe rationally as many truths as possible. They would be inclined to agree, that is, that we ought to be curious about the world; we ought to find out as much about it as we can. (p. 55)

⁷ Some examples: "[O]ur basic cognitive aim is to come into possession of as much truth as possible and to avoid false beliefs" (Alston 1982, p. 7); "A very plausible set of [cognitive] goals are the oft-cited aims of believing the truth—as much truth as possible—and avoiding error" (Goldman, 1980, p. 32); "I have suggested that epistemic justification is essentially related to the cognitive goal of truth.... We aim both to avoid as much error as we can and to obtain as much truth as we can" (Moser 1985, p. 5). It is also common to talk of propositional space, of truths being regions of propositional space, of propositional space being divided into regions believed or known and regions not believed or known, and so on.

Regardless of whether Foley and Fumerton are right that most people would agree with the suggestion they mention, their phrasing makes clear they think that finding out as much about the world as we can is the very same thing as, or is just another way of talking about, believing as many truths as possible. This is presented not as a substantive picture or theory of the relation between more truth and more truths, it is presented as (and the reader naturally takes it to be, I think) an alternative locution for the very same thing.⁸

We can also see the grip of the conception of truth on which ordinary everyday truths have number but not extent by looking at what is known as the trivial truths objection to the claim that the goal of inquiry is to acquire more truth. This could not be the goal of inquiry, the objection insists, because some truths are significant and others are trivial and inquiry properly ought to aim for the significant truths over the trivial ones. Inquiry aims for more truth, perhaps, but not just more truth – it aims for some kinds of truth more than other kinds. I have discussed this argument at length elsewhere⁹ so will only point out here that those who give the objection, or find it compelling, have simply assumed without argument that so-called trivial truths and so-called significant truths are the same amount of truth – one truth's worth of truth, if you will. Strictly speaking that is compatible with the idea that ordinary truths have both number and extent, as long as the extent each has is always the same. But it is more reasonable to think that background assumption is simpler and is just that the measure of truth is cardinality alone.

At this point the reader may well be confused. I seem to have argued both that we have a latent conception of truth on which ordinary, everyday truths have both cardinality and extent, *and* that we (or many of us) have a latent conception of truth on which, when it comes to ordinary truths, cardinality is everything. That sounds like I am contradicting myself. I think the proper read of the situation, however, is that what I've said is true and it points to a deep ambiguity in how we think about the measure of truth.

The problem with attributing the numbers-are-everything view as a settled view rather than as something people endorse in temporary or fleeting contexts is that if it is a stable feature of how people think about the measure of truth then they would have to either (i) maintain that line even in the face of

⁸ I discuss this example and the point I'm making here at greater length in Treanor 2018.

⁹ See Treanor 2013 (pp. 598-599), Treanor 2014, and Treanor 2018 (1055-1056).

patent counterexamples or (ii) endorse some version of genuine atomism about truth, which few would be willing to do. Consider a philosopher who endorses the trivial truths argument and who alleges they think the question “how much truth does S believe” and “how many truths does S believe” are the same question worded differently. What do they say when confronted with this pair of ordinary, everyday truths:

1. I am wearing a blue jacket.
2. I am wearing a blue jacket and black shoes.

Each of those is one truth, but it would be very hard to deny that the second is more truth than the first.

If a person really thinks how much truth and how many truths are the same, though, then they either have to affirm that 1 and 2 above are the same amount of truth, or they have to affirm that the second is more than one truth (e.g., two truths). In this example, this latter option is the obvious one. Denying 2 is more truth than 1 seems to be a non-starter, whereas taking 2 to be two truths rather than merely one is an easy thing to endorse and the natural dialectical move. The problem, however, is that it is very hard to see how to stop this process once it starts, or to make sense of where it stops. For consider:

3. I am wearing a blue jacket.
4. I am wearing a jacket.
5. I am wearing something.
6. I stand in some spatiotemporal relation to a jacket.
7. I stand in some spatiotemporal relation to something that isn't me or a part of me.
8. Something stands in the wearing relation to something else.
9. Something stands in some spatiotemporal relation to something else.

We wanted to solve the original puzzle by saying that 2 was really two truths, the truth that I am wearing a blue jacket and the truth that I am wearing black shoes. As a first step that seems the right thing to say. But it's very hard to see that things stop there. The truth that I am wearing a blue jacket seems to tell us more about the world, and therefore to be more truth (more truth not more true) than that I am wearing something, that I stand in some spatiotemporal relation (of which wearing is just one option) to a jacket, and so on. The person who wants to maintain that numbers-are-everything can't stop at explaining that 2 is more truth than 1 by saying it is two truths rather than one truth. They need to find a place where the possibility of further division stops and therefore genuine, non-arbitrary counting can begin. That would be genuinely atomic level – by definition.

Let me step back for a moment and address where we are in the discussion. I started by saying that some sort of compositional picture of truth seems both natural and rooted deeply in our discipline.

I then distinguished two versions of this decompositional picture. Both agree that decomposition continues to an atomic level such that there are genuinely atomic, discrete truths, which have a cardinality. But they disagree on whether there is, quantitatively, more than that to the measure of truth (such a thing as the extent of truth, illustrated by comparison to volume in the domain of the physical). I then said that, for the most part, philosophers don't think about this issue with regard to truth atoms but do think about it, at least in an oblique and indirect way, with regard to ordinary truths, truths that are expressed by the everyday sentences of natural language. 'Think about' might be too strong a way to put it, the basic idea being that our thought and talk is largely silent on the question with regard to atomic truths but does reflect something on the question with regard to ordinary truths. What it reflects however is a deep ambiguity. We use metaphors on which truths have both number and extent and we naturally move to massy talk when count talk starts to baffle (or find such moves intelligible rather than incoherent when other people make them). But we also employ arguments, and claim to subscribe to views, that collapse quantity into mere number, even when talking about ordinary truths. In the space remaining, what I'd like to do is turn from ordinary truths to atomic truths and put pressure on the possibility that a version 1 atomism is true. My goal will not be to defend version 2 atomism – I have separate doubts about that. It will be rather to say that if the options are version 1 atomism or version 2 atomism, then version 2 atomism, specifically a version 2 atomism in which truths have extent but not all the same extent, must be true.

Version 1 atomism holds that there are atomic truths and that there is no dimension to size other than cardinality. To show this sort of atomism is false what we need is a case where there are two bodies (that is intended to be ontologically uncommitting) of truth, each with the same number of atomic truths, yet where one is more truth than the other. In one sense it is difficult to imagine how to construct such a case since we have no idea what atomic truths would look like; to paraphrase Russell, as quoted earlier in the paper, atomic truths are not experienced as such but known only inferentially as the limit of analysis. Thus it seems impossible to collect 500 of them here and 500 of them there and compare which collection, if either, is more truth than the other. But in another sense we can do this, for there is another way for the cardinality of two sets to be the same other than by each set containing the same finite number of truths. We need only construct an example where each body of truths has the same infinite

cardinality, say the cardinality of the continuum, but where one collection of truths is, or seems to be with whatever clarity our intuitions can establish, more truth than the other.

Here is such a case: Start by thinking of the Encyclopaedia Britannica and a brief pamphlet for tourists that sketches some info about a location attraction such as a historic castle. Assume that each contains nothing but the truth. It seems pretty clear that the encyclopaedia contains more truth than the brief pamphlet, but this isn't the case we're looking for since it's far from clear that each contains the same number of truths (finite or otherwise). However, now consider what we can call the alethic complements of each:

The alethic complement of the tourist brochure is something that contains or expresses every truth that it does not. The alethic complement of the Encyclopaedia Britannica contains or expresses every truth that it does not. The relation of being an alethic complement is symmetric, and a pair of alethic complements is a complete description of the world. (Treanor 2018, 1062)

In the next step, consider which alethic complement seems to contain or express more truth: the one that contains everything that's true save what's in the Encyclopaedia Britannica, or the one that contains everything that's true save what's in the local tourist pamphlet:

The alethic complement of the tourist pamphlet contains a vast amount of truth—just think of all the truth, about any topic whatsoever, that the tourist brochure leaves out. The truth contained in the alethic complement of the Encyclopaedia Britannica is also vast, as well-researched and comprehensive an encyclopaedia as it is. Yet the truth contained in the alethic complement of the Encyclopaedia Britannica is not quite so vast as the truth contained in the alethic complement of the tourist pamphlet. This is more or less the claim we started with, given what an alethic complement is: There is more truth in the Encyclopaedia Britannica than in the tourist pamphlet. (Treanor 2018, 1062)

For the final step of the argument, notice that the case we are describing is one wherein what's being compared are two bodies of truth where, if any version of atomism about truth is true, each body of truth has the same cardinality:

[I]f there is any number of truths at all, then it is an infinite number, presumably a very large infinity. So the two alethic complements each contain infinitely many truths—and importantly and most plausibly, the same order of infinity. So we have a difference in how much truth each contains without any difference in the cardinality of the truths that each contains. (Treanor 2018, 1062)

If this argument is sound, then if atomism is true then there must be something, beyond cardinality, that contributes to the measure of truth. The truths at the bottom level, whatever they are, would not be version 1 atomic truths.

Here we can circle back and see the parallel with atomism version 1 and atomism version 2. Take any circle and imagine it cut in four, like a pie with four large slices. Any single slice has exactly as many points as the other three put together – the cardinality of the continuum. Put another way, the number of points in a given plane figure doesn't tell us what size it is (in fact, it tells us nothing at all about its size). Nonetheless it is intelligible that any three slices together are bigger than any one slice alone, since they take up more space or extend further in a two-dimensional plane. If there are atomic truths, then there must be something akin in the domain of truth.

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